OIPE JC64
JUN 0 1 2004
PATENT & TRADEMARK OFFICE

FIG. 1

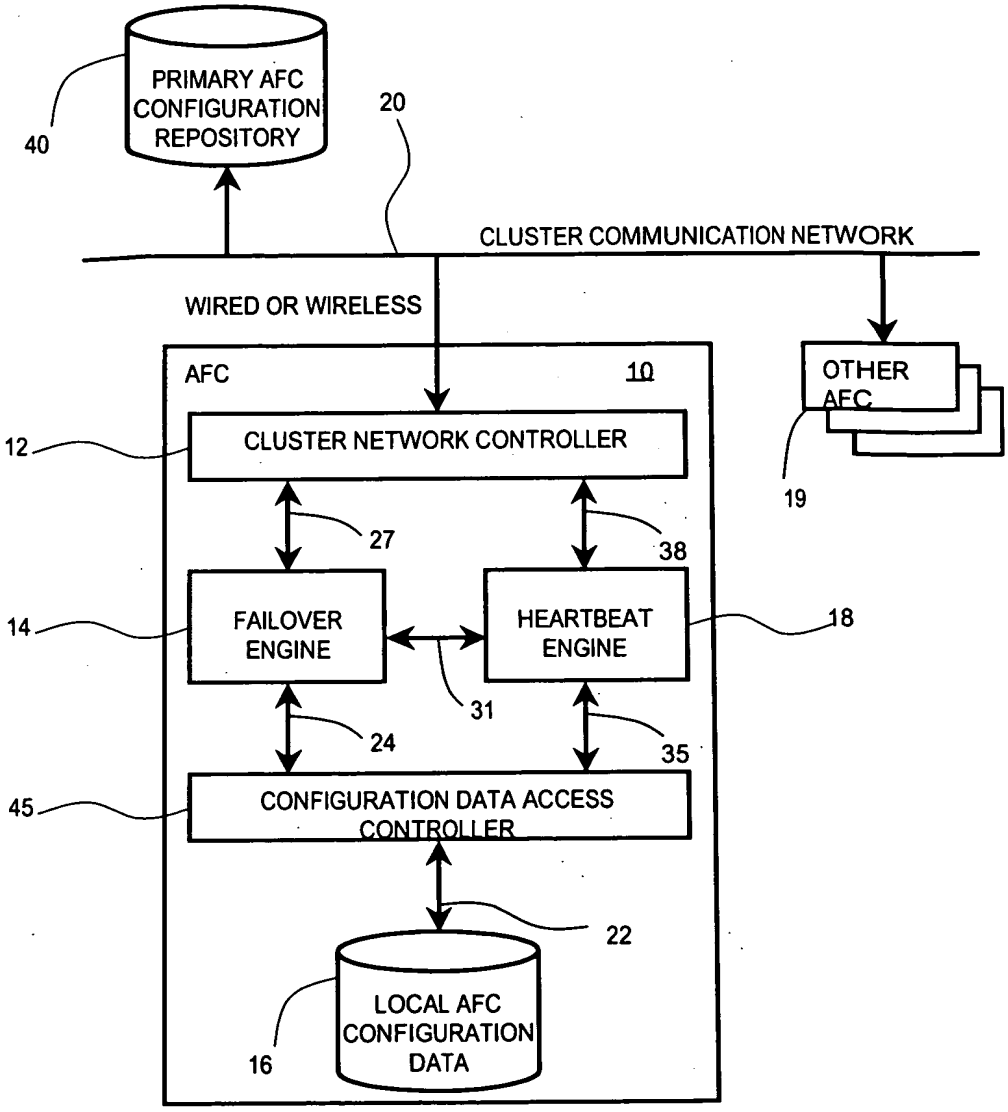

FIGURE 2

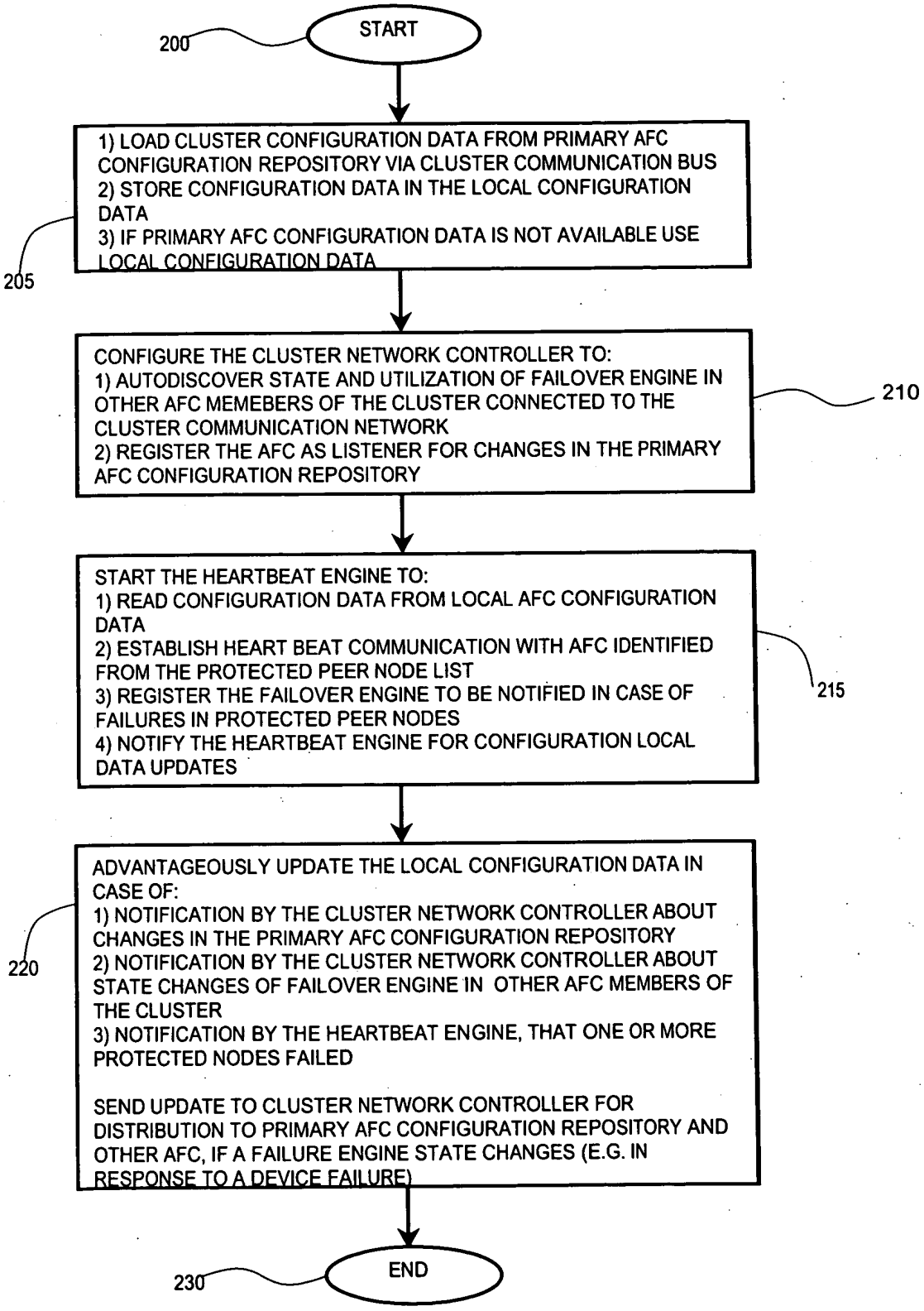
START
200
1) LOAD CLUSTER CONFIGURATION DATA FROM PRIMARY AFC CONFIGURATION REPOSITORY VIA CLUSTER COMMUNICATION BUS
2) STORE CONFIGURATION DATA IN THE LOCAL CONFIGURATION DATA
3) IF PRIMARY AFC CONFIGURATION DATA IS NOT AVAILABLE USE LOCAL CONFIGURATION DATA
205
CONFIGURE THE CLUSTER NETWORK CONTROLLER TO:
1) AUTODISCOVER STATE AND UTILIZATION OF FAILOVER ENGINE IN OTHER AFC MEMEBERS OF THE CLUSTER CONNECTED TO THE CLUSTER COMMUNICATION NETWORK
2) REGISTER THE AFC AS LISTENER FOR CHANGES IN THE PRIMARY AFC CONFIGURATION REPOSITORY
210
START THE HEARTBEAT ENGINE TO:
1) READ CONFIGURATION DATA FROM LOCAL AFC CONFIGURATION DATA
2) ESTABLISH HEART BEAT COMMUNICATION WITH AFC IDENTIFIED FROM THE PROTECTED PEER NODE LIST
3) REGISTER THE FAILOVER ENGINE TO BE NOTIFIED IN CASE OF FAILURES IN PROTECTED PEER NODES
4) NOTIFY THE HEARTBEAT ENGINE FOR CONFIGURATION LOCAL DATA UPDATES
215
ADVANTAGEOUSLY UPDATE THE LOCAL CONFIGURATION DATA IN CASE OF:
1) NOTIFICATION BY THE CLUSTER NETWORK CONTROLLER ABOUT CHANGES IN THE PRIMARY AFC CONFIGURATION REPOSITORY
2) NOTIFICATION BY THE CLUSTER NETWORK CONTROLLER ABOUT STATE CHANGES OF FAILOVER ENGINE IN OTHER AFC MEMBERS OF THE CLUSTER
3) NOTIFICATION BY THE HEARTBEAT ENGINE, THAT ONE OR MORE PROTECTED NODES FAILED
SEND UPDATE TO CLUSTER NETWORK CONTROLLER FOR DISTRIBUTION TO PRIMARY AFC CONFIGURATION REPOSITORY AND OTHER AFC, IF A FAILURE ENGINE STATE CHANGES (E.G. IN RESPONSE TO A DEVICE FAILURE)
220
END
230

FIGURE 3

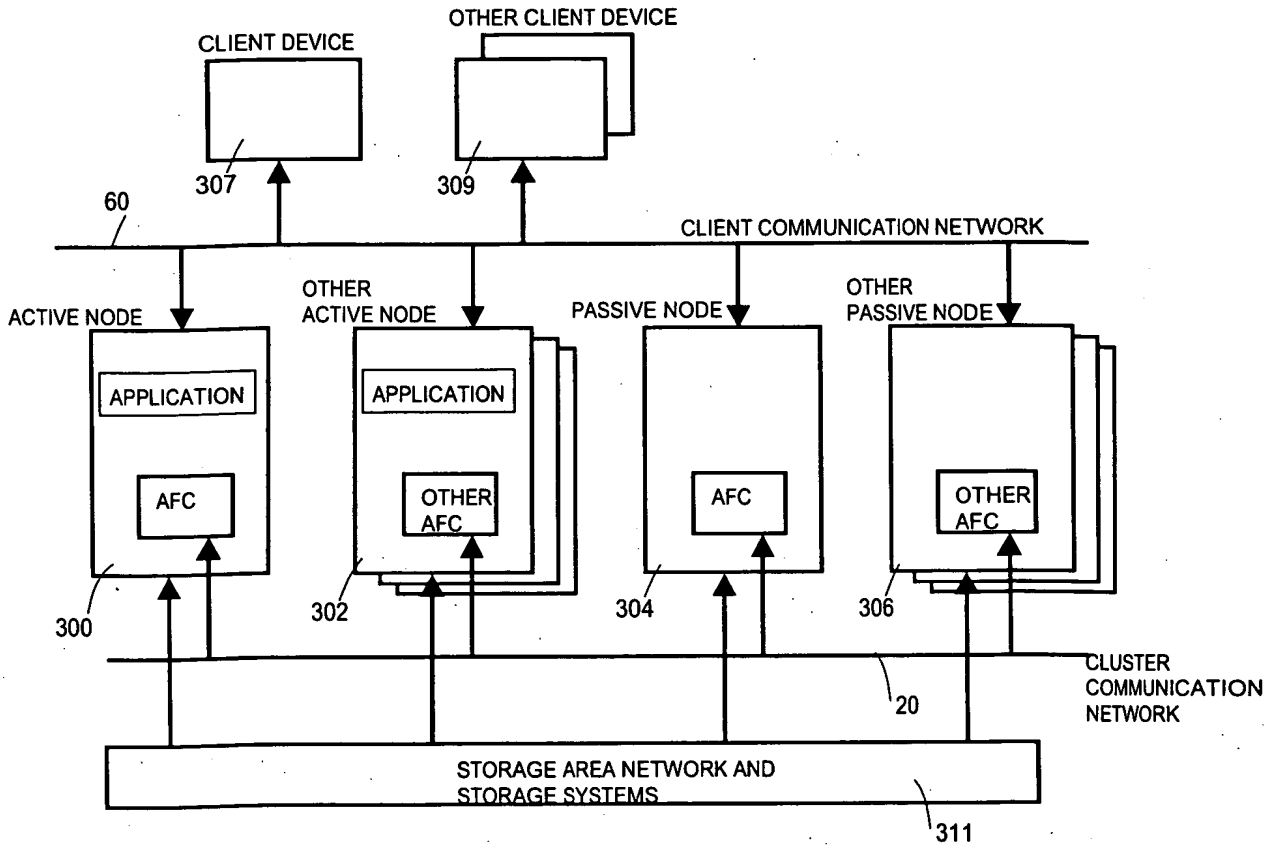
CLIENT DEVICE
OTHER CLIENT DEVICE
307
309
60
CLIENT COMMUNICATION NETWORK
ACTIVE NODE
OTHER ACTIVE NODE
PASSIVE NODE
OTHER PASSIVE NODE
APPLICATION
APPLICATION
AFC
OTHER AFC
AFC
OTHER AFC
300
302
304
306
CLUSTER COMMUNICATION NETWORK
20
STORAGE AREA NETWORK AND STORAGE SYSTEMS
311

FIGURE 4

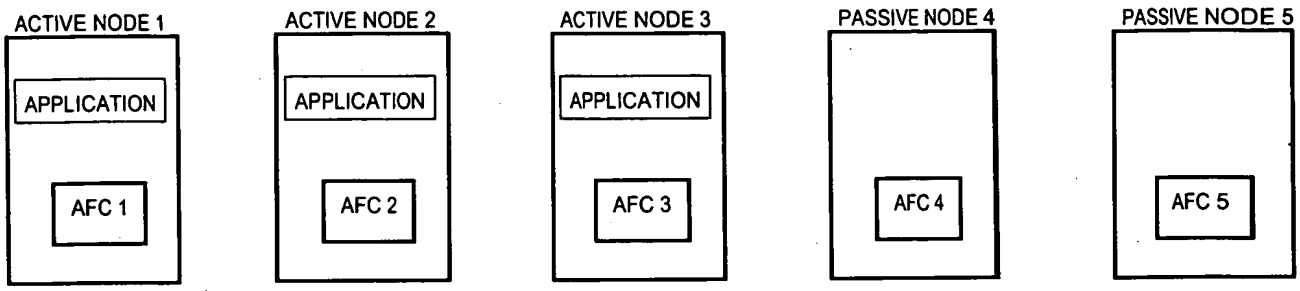
ACTIVE NODE 1
APPLICATION
AFC 1
ACTIVE NODE 2
APPLICATION
AFC 2
ACTIVE NODE 3
APPLICATION
AFC 3
PASSIVE NODE 4
AFC 4
PASSIVE NODE 5
AFC 5

FIGURE 5

Backup priority list (all nodes)

Protected node	Node 1	Node 2	Node 3	Node 4	Node 5
Primary backup	Node 4	Node 4	Node 5	Node 5	Node4
Secondary Backup	Node 5	Node 5	Node 4	N	N
Node state	A	A	A	A	A

FIGURE 6

Backup priority list (Node 4)

Protected node	Node 1	Node 2	Node 3	Node 4	Node 5
Primary backup	Node 4	Node 4	Node 5	Node 5	Node4
Secondary Backup	Node 5	Node 5	Node 4	N	N
Node state	A	A	A	N	A

600

FIGURE 7

Backup priority list (All other nodes)

Protected node	Node 1	Node 2	Node 3	Node 4	Node 5
Primary backup	Node 4	Node 4	Node 5	Node 5	Node4
Secondary Backup	Node 5	Node 5	Node 4	N	N
Node state	A	A	A	A	A

FIGURE 8

Backup priority list (all nodes)

Protected node	Node 1	Node 2	Node 3	Node 4	Node 5
Primary backup	N	N	Node 5	Node 5	N
Secondary Backup	Node 5	Node 5	N	N	N
Node state	A	A	A	N	A

800 802 804 806 808

FIGURE 9

Backup priority list (all nodes)

Protected node	Node 1	Node 2	Node 3	Node 4	Node 5
Primary backup	N	N	N	N	N
Secondary Backup	N	N	N	N	N
Node state	N	A	A	N	N

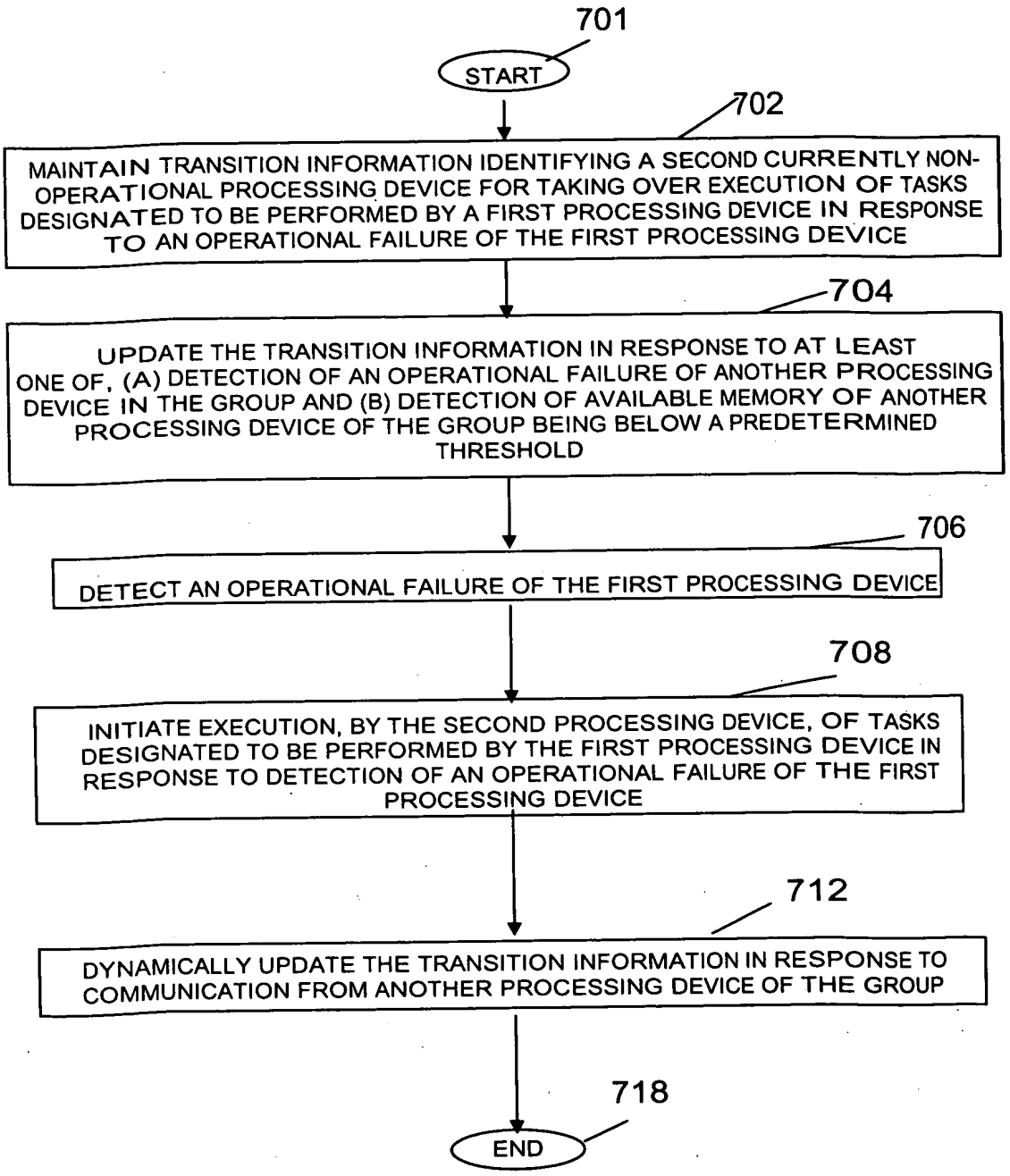
701
START
702
MAINTAIN TRANSITION INFORMATION IDENTIFYING A SECOND CURRENTLY NON-OPERATIONAL PROCESSING DEVICE FOR TAKING OVER EXECUTION OF TASKS DESIGNATED TO BE PERFORMED BY A FIRST PROCESSING DEVICE IN RESPONSE TO AN OPERATIONAL FAILURE OF THE FIRST PROCESSING DEVICE
704
UPDATE THE TRANSITION INFORMATION IN RESPONSE TO AT LEAST ONE OF, (A) DETECTION OF AN OPERATIONAL FAILURE OF ANOTHER PROCESSING DEVICE IN THE GROUP AND (B) DETECTION OF AVAILABLE MEMORY OF ANOTHER PROCESSING DEVICE OF THE GROUP BEING BELOW A PREDETERMINED THRESHOLD
706
DETECT AN OPERATIONAL FAILURE OF THE FIRST PROCESSING DEVICE
708
INITIATE EXECUTION, BY THE SECOND PROCESSING DEVICE, OF TASKS DESIGNATED TO BE PERFORMED BY THE FIRST PROCESSING DEVICE IN RESPONSE TO DETECTION OF AN OPERATIONAL FAILURE OF THE FIRST PROCESSING DEVICE
712
DYNAMICALLY UPDATE THE TRANSITION INFORMATION IN RESPONSE TO COMMUNICATION FROM ANOTHER PROCESSING DEVICE OF THE GROUP
718
END

FIGURE 10